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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
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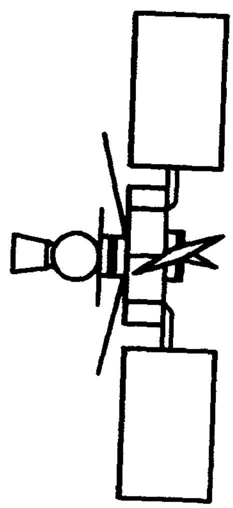
FOR RELEASE: MONDAY P.M.
June 27, 1966

RELEASE NO: 66-162

PROJECT: INTERPLANETARY EXPLORER D
(Anchored Interplanetary Monitoring Platform)

(To be launched no earlier than June 30)

CONTENTS



NEWS NASA
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MOON ORBITING
EXPLORER SCHEDULED
FOR JUNE 30 LAUNCH

An Explorer spacecraft is scheduled for launch by the United States with the mission of orbiting the Moon to study interplanetary space phenomena in the vicinity of the Moon's orbit around the Earth.

The 206-pound spacecraft is the fourth in a series of seven Interplanetary Explorers planned by the National Aeronautics and Space Administration and the first to attempt to orbit the Moon.

The spacecraft, called Anchored Interplanetary Monitoring Platform (AIMP), is scheduled for launch from Cape Kennedy, Fla., no earlier than June 30.

Because of the exceedingly precise trajectory required for its mission, the launching is limited to a daily three-minute period between June 30 and July 3.

The launch vehicle is the three-stage Thrust-Augmented Improved Delta rocket. No midcourse maneuver will be made during the planned 72-hour flight to the vicinity of the Moon where a small 916-pound thrust retromotor mounted on top of AIMP is scheduled to be fired making it possible for the Moon's gravitational field to capture the spacecraft.

-more- 6/23/66

If all events go as planned, the spacecraft will attain a lunar orbit with an apolune or high point above the Moon of about 4,000 statute miles, a perilune of about 800 miles and an inclination of about 175 degrees retrograde to the lunar equator. In this orbit, AIMP would circle the Moon once every ten hours.

The primary mission objectives of this Interplanetary Explorer launch are:

- to study at lunar distances the magnetic tail and magnetosphere of the Earth in interplanetary space every 29 and one-half days rather than once a year by means of a lunar anchored spacecraft; and

- to measure interplanetary magnetic fields, solar plasma, and energetic particles in cislunar space.

Thus, placing AIMP into orbit around the Moon anchors it in interplanetary space and permits extended periods of study away from the influence of the Earth's magnetic field which is 40 times stronger than the lunar magnetic field. The Moon's orbit will take AIMP through the Earth's magnetic tail once a month as compared with the once a year studies possible from highly elliptical Earth orbits.

In addition to its studies of interplanetary phenomena, AIMP will study the lunar gravitational field and the weak lunar ionosphere to better understand the space environment of the Moon.

The payload consists of six scientific experiments, two passive experiments, and one engineering experiment -- a solar cell damage study. These were provided by scientists from the University of California, the State University of Iowa, Stanford University, the Massachusetts Institute of Technology, and NASA's Ames Research Center and Goddard Space Flight Center.

Wherever possible, handling of all spacecraft components -- as well as the fully assembled spacecraft -- has been under strict cleanroom conditions. In addition, every effort has been made to make AIMP the most magnetically clean spacecraft ever launched by the United States.

Two anchored IMP spacecraft are presently programmed by NASA. Three regular IMPs have been launched. Each of them has contributed valuable scientific information.

Data obtained by AIMP and regular IMP spacecraft are also useful in determining the radiation levels to be expected during Apollo flights to the Moon, as well as aiding in the eventual development of a solar flare prediction capability for that program. Moreover, results from the AIMP program can be expected to contribute to future space exploration efforts by uncovering new phenomena to be investigated.

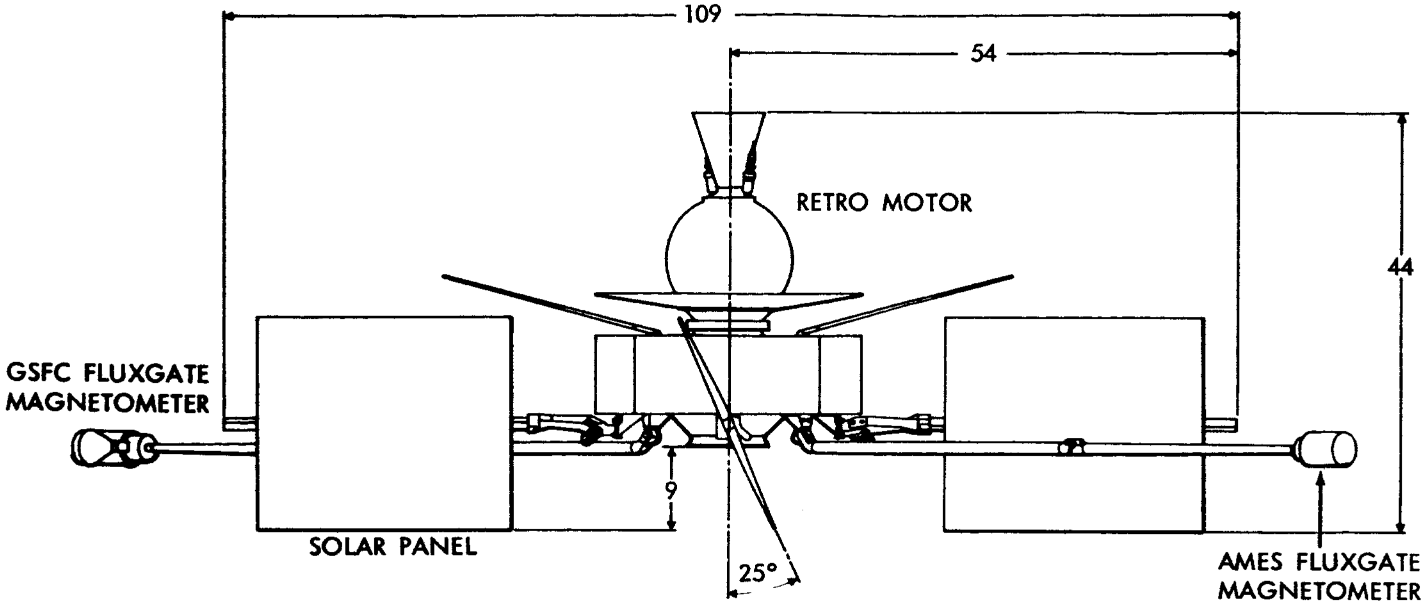
AIMP and IMP spacecraft are part of the scientific space exploration program conducted by NASA's Office of Space Science and Applications.

Project technical management for both programs is directed by the Goddard Space Flight Center, Greenbelt, Md. The design, fabrication and experiment integration of these spacecraft is conducted at Goddard with limited contractor support.

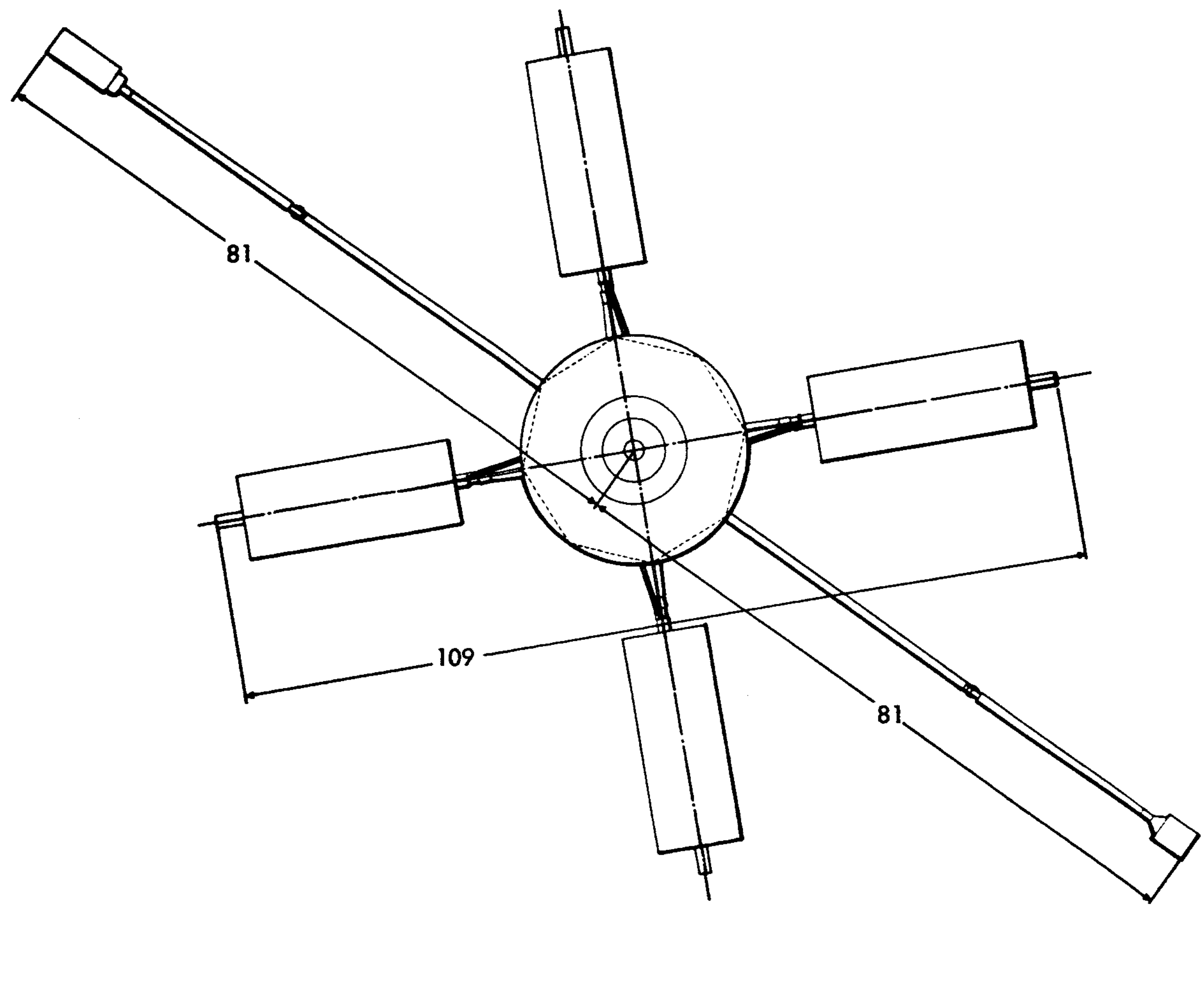
END OF GENERAL RELEASE

(BACKGROUND INFORMATION FOLLOWS)

ANCHORED INTERPLANETARY MONITORING PLATFORM



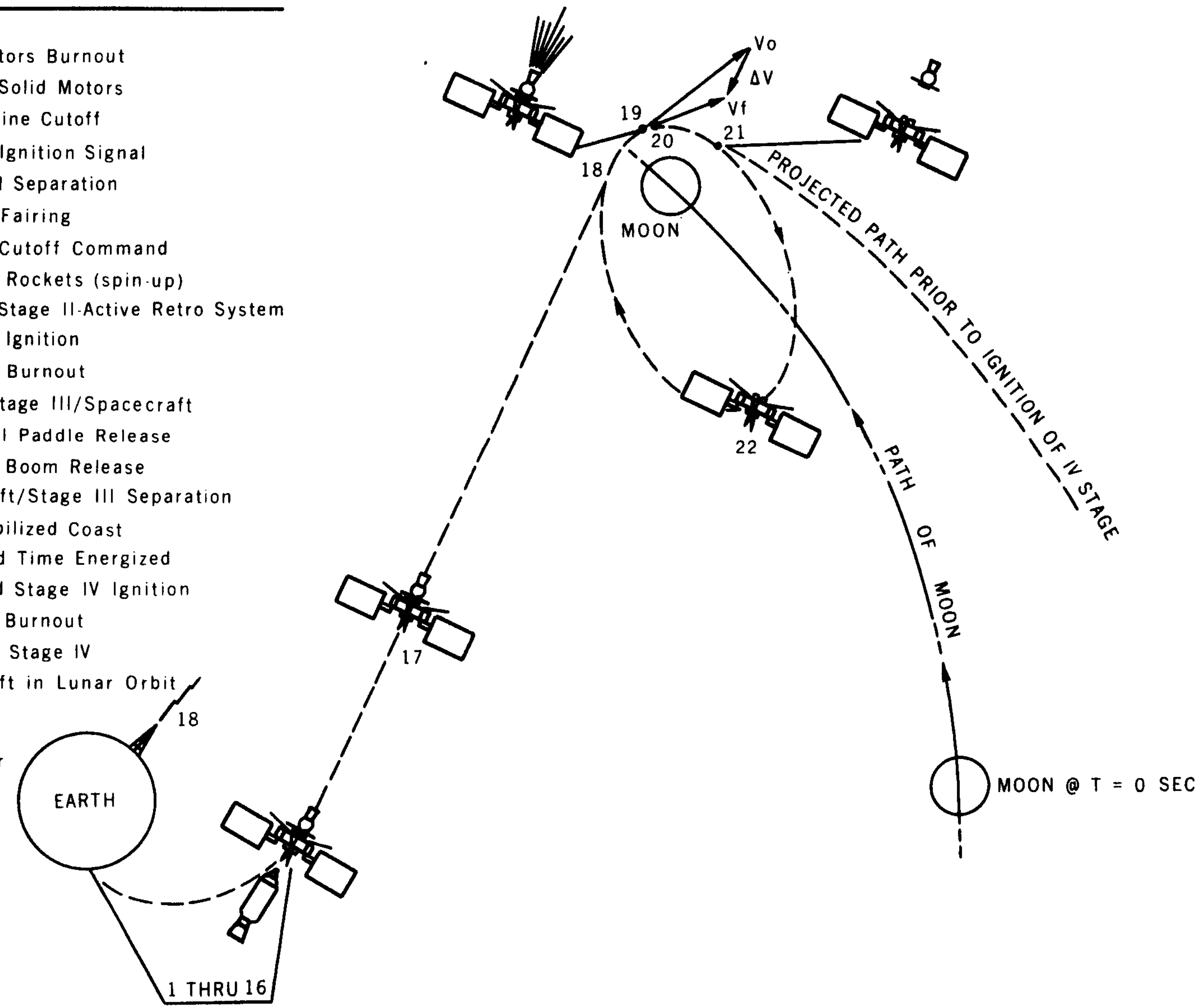
* MEASUREMENTS SHOWN IN INCHES

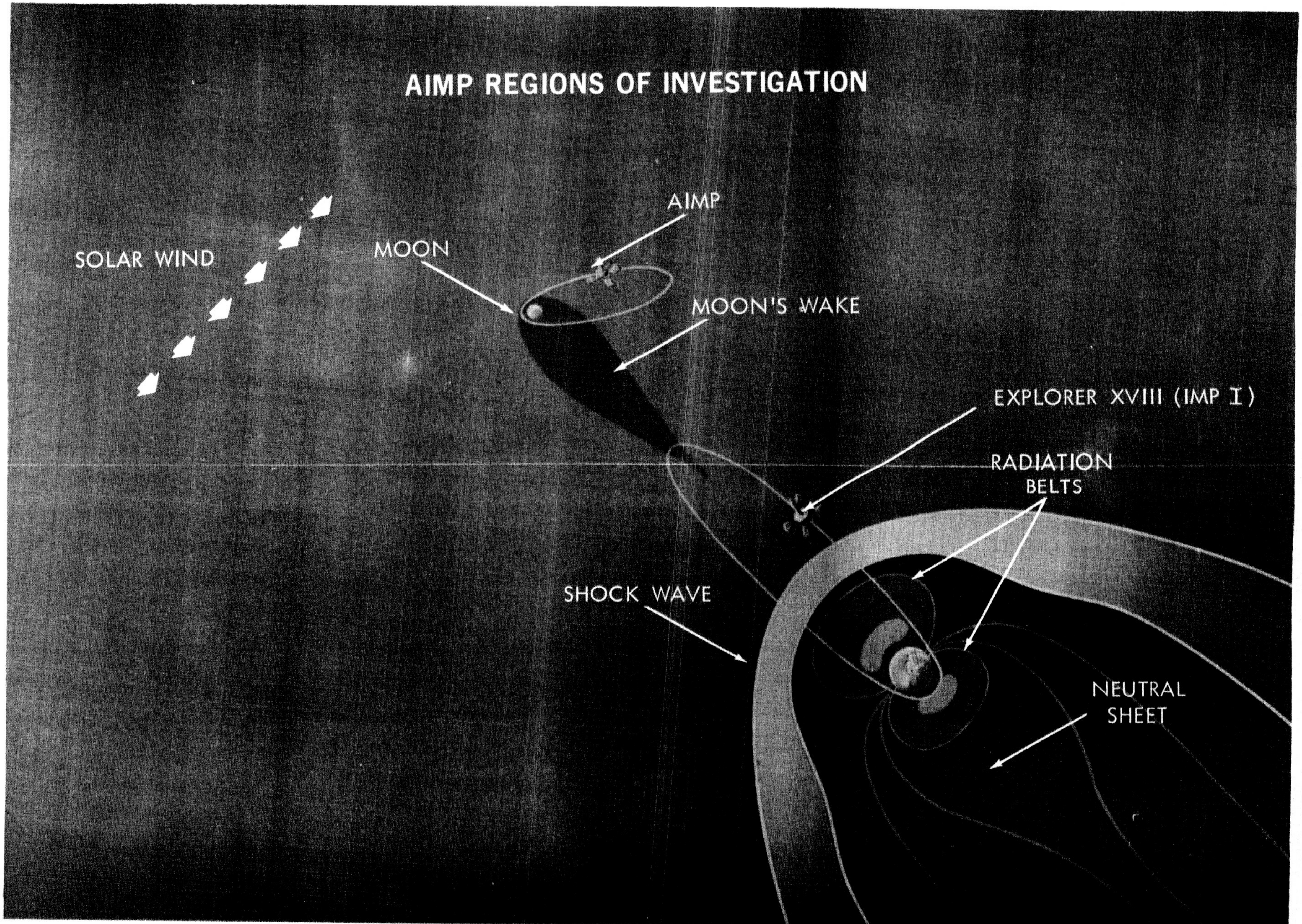


ANCHORED IMP LAUNCH SEQUENCE

Sequence No	Time/sec	Event
1	0	Liftoff
2	43	Solid Motors Burnout
3	70	Jettison Solid Motors
4	150	Main Engine Cutoff
5	154	Stage II Ignition Signal
6	155	Stage I/II Separation
7	216	Jettison Fairing
8	537	Stage II Cutoff Command
9	1006	Fire Spin Rockets (spin-up)
10	1008	Jettison Stage II-Active Retro System
11	1021	Stage III Ignition
12	1052	Stage III Burnout
13	2000	Despin Stage III/Spacecraft
14	2048	Solar Cell Paddle Release
15	2050	Flux-gate Boom Release
16	2055	Spacecraft/Stage III Separation
17		Spin Stabilized Coast
18	DBC	Command Time Energized
19	DBC+T	Command Stage IV Ignition
20	DBC+T+22	Stage IV Burnout
21	DBC+T+1222	Separate Stage IV
22		Spacecraft in Lunar Orbit

T = Timer
DBC = Determined By Computer




AIMP REGIONS OF INVESTIGATION
SOLAR WIND
MOON
AIMP
MOON'S WAKE
EXPLORER XVIII (IMP I)
RADIATION BELTS
SHOCK WAVE
NEUTRAL SHEET

THE SPACECRAFT

Physically, the 206-pound AIMP resembles Goddard-designed and built Interplanetary Monitoring Platform (IMP) Spacecraft. The notable exception is that AIMP has a retromotor located in the top of its octagon-shaped main body, whereas the standard IMP series carried a ball-shaped rubidium vapor magnetometer at the end of an extendable pole in this location. Also, the transmitting antennas were moved nearer to the outer edge of the main body top cover. Other than these differences the spacecraft are practically identical in physical makeup. Like IMP spacecraft, AIMP is also spin-stabilized in orbit.

Individual component locations in the AIMP 28-inch-diameter main base were determined by the look angles needed by the experiments, the thermal dissipation needed, as well as spacecraft weight balance.

The heat-producing transmitter and prime converter are positioned at opposite sides of the main body in order that heat generated by these components would be conducted away through the honey-comb aluminum bottom shelf of the spacecraft.

The AIMP telemetry data system consists of a prime encoder, a digital data processor, and needed programmer functions. The encoder uses the so-called burst-burst (no blank) PFM (pulse frequency modulation) transmission with 16 level digital oscillators.

All digital and "sync" frequencies are crystal-controlled. The basic accumulator can handle 16 bits of digital data. The bit rate for digital data is 25 bits per second while that for analog data is 43 bits per second.

Programmer functions include undervoltage sensing and power turn-off for battery charging, fourth stage firing and separation timers, magnetometer flipper timer operations, and fourth stage burn time indication.

The telemetry communications system consists of a combined range and range rate and telemetry transmitter system with a redundant command receiver and decoder to maximize retro-motor firing and separating probabilities. The transmitter is PFM-PM and radiated power will be at least six watts--capable of transmitting signals to Earth from lunar distances.

The spacecraft primary power system consists of four solar paddles supplying an average power of 43 watts, a shunt voltage regulator circuit and a 10AH silver cadmium battery. The 10AH battery should allow spacecraft operation in extended shadows of up to 2.5 to 3 hours.

AIMP also carries an optical aspect system capable of sensing the Moon and the Sun and determining the spin axis Sun angle to plus or minus 5/10ths of a degree.

THE FLIGHT PLAN

The flight path for the AIMP mission will be the first trajectory in the history of rocketry which does not require a mid-course maneuver to achieve lunar orbit.

The flight parameters are so stringent that Delta Number 39 must attain a flight velocity to within one third of one percent. To achieve the proper orbit, Delta will be shooting at a target well ahead of the Moon. If all goes well, orbital insertion should occur 72 hours after liftoff, about 3,000 miles ahead of the Moon, at which time the retro-motor will be fired.

This launçhing will also mark one of the shortest launch windows, three minutes, in American space launchings. The window is four days in early July and only three days in the latter part of July.

The launching will be from Launch Complex 17, Pad A, and will be the 39th flight for the reliable space booster. To date, Delta has achieved orbit 35 times out of 38 attempts.

It will be the fourth flight for NASA's Thrust Augmented Improved Delta which has the capability of hurling almost three times more weight into orbit than the earlier Deltas.

The 80-pound retromotor to be used in the AIMP Mission is a Thiokol Chemical Company TE-M-458 solid-fuel rocket. Its purpose is to decelerate the spacecraft as it approaches the Moon to a velocity slow enough to allow it to be captured by the Moon's gravitational field.

Time of firing the 916-pound thrust motor in the Moon's vicinity will be determined at the Goddard AIMP Control Center about five or six hours after launching. Nominal burn time of the motor is 20 to 22 seconds. About two hours after burn-out the retromotor will be separated from the spacecraft either by ground command or by an automatic jettison system.

EXPERIMENTS

Magnetic Field Experiments

The basic device for measuring magnetic fields is the magnetometer. Two magnetometers--both of the fluxgate variety--are carried by the AIMP. They were contributed by the NASA Ames Research Center and the NASA Goddard Space Flight Center.

The Ames Magnetometer. This device consists of a boom-mounted sensor unit located about seven feet from the center of the AIMP. Electronics for the device are mounted in the main body. It consists of three orthogonally-mounted flux-gate sensors, two of which are mounted perpendicular to the spacecraft spin axis and one parallel to the spin axis. A flipper system will rotate the two sensors about 90 degrees each day to permit calibration of the sensor which is parallel to the spin axis.

This very sensitive device will be able to measure spatial and temperal variations of interplanetary and lunar magnetic fields in ranges of from .2 to 200 gammas.

The Goddard Magnetometer. This device is also boom-mounted and is a three-component fluxgate device with a flipper mechanism.

The sensors are arranged so that one is parallel to the spacecraft spin axis and two are perpendicular to the spin axis. A flipper device reorients the array every 24 hours by rotating two sensors about 90 degrees to permit calibration.

The dynamic measuring range of this magnetometer is 64 gammas. In addition to complementing the Ames device in measuring interplanetary and lunar magnetic fields, the Goddard magnetometer is designed to obtain information on the interaction of the solar wind with the lunar magnetic field.

Radiation Experiments

Three different radiation monitoring experiments will be flown on the first AIMP. They include an energetic particles experiment designed by the University of California; an electron and proton experiment from the University of Iowa; and a thermal ion and electron experiment from the Goddard Space Flight Center.

Energetic Particles Experiment. Designed and built by the University of California at Berkeley, this experiment has the following objectives:

* Measurement of low energy solar electrons. Recently, electrons with energies of 40 KeV were discovered being emitted from solar flares. This experiment will provide more information on solar and interplanetary correlations of these particles, their energy and spatial distribution.

* The study of energetic electron fluxes in the geomagnetic tail of the Earth's magnetosphere. From Explorer XVIII (IMP I) measurements it was found that isolated fluxes of high energy electrons occasionally appear in the geomagnetic tail. It is hoped data from AIMP will help in determining how these electron "island" fluxes originate and what significance they have in relation to other phenomana in this region of space.

* Low energy solar flare protons measurements will be conducted and the time history of these events obtained in detail.

* An ion chamber included with the experiment will provide a monitor of the galactic cosmic ray intensity and of solar protons above 12 MeV.

Electrons and Protons Experiment. Contributed by the University of Iowa, the basic objectives of this experiment are to:

* Study the spatial, temporal and angular distribution of electrons with energies exceeding 40 KeV in the magnetospheric wake of the Earth at distances up to 60 Earth radii.

* Search for electrons with energies exceeding 40 KeV in the wake of the Moon, and to conduct a detailed study of their distribution, if in fact, intensities of this level are detected.

* Study the incidence and intensity of low-energy solar cosmic rays versus time profile (protons and alpha particles separately) in interplanetary space, and determine their energy spectra and angular distribution.

* Study solar X-Rays in the 0-14 Angstrom range.

The experiment consists of a series of three electron devices having different view angles.

Thermal Ion and Electron Experiment. Designed and built by the Goddard Space Flight Center, this experiment has the following objectives:

* To measure low energy electrons and ions in the vicinity of the Moon.

* To detect the presence or absence of a lunar magnetosheath and/or shock front.

* To observe the flow of the solar wind around the Moon.

* To make a comparison with data from the MIT plasma probe to determine if the observed electron high energy component as measured by an integral spectrum experiment can be interpreted in terms of solar wind electron temperature and number density.

The sensor for this experiment is also of the Faraday cup variety.

Solar Wind Experiment

Plasma Probe. The single solar wind experiment onboard AIMP is called a plasma probe. It was provided by the Massachusetts Institute of Technology and is intended to measure the following phenomena:

* Angular distribution of the total proton flux in the equatorial meridian plane of the spacecraft.

* Energy distribution of the proton flux at or near the same angle as the peak of the total proton flux.

The sensor, a Faraday Cup, is mounted with its direction of view at right angles to the spin axis of the spacecraft. As it rotates with AIMP, the variation of the signal with time will be determined by the directional characteristics of the plasma in the equatorial plane and by the angular acceptance function of the sensor itself. The experiment will measure the energy spectrum and angular distribution of the proton and electron flux of the plasma in the range of 100 MeV to 5 KeV.

Passive Experiments

The AIMP passive experiments will use telemetry and range and range-rate signals as data sources to study selenodesy--the physical geography of the Moon--and propagation of lunar ionosphere radio waves. They consist of the following:

* A Stanford University study to analyze the spacecraft telemetry signal and determine the effects of the lunar ionosphere on radiowave propagation.

* A University of California (Los Angeles) study will analyze variations in the range and range-rate tracking data to obtain selenodetic information.

Solar Cell Damage Experiment

The solar-cell damage study is a Goddard Space Flight Center engineering experiment which will provide information on radiation damage to solar cells and solar-cell cover glass of varying thicknesses and compositions, as well as on the protection afforded solar cells by various types of cover glass.

An area on the spacecraft main body will carry a panel of four groups of sixteen one-by-two centimeter n-on-p silicon solar cells. One group of cells will be unshielded. The second will have an integral 25-micron cover glass. The third will have a six-mil fused silica cover glass. The fourth group will have a six-mil microsheet cover.

The sixteen solar cells composing each group will be series-connected to a 60-ohm precision resistor of the size required to produce a 4.0- to 4.5-volt output under "space" conditions with normal illumination. The solar cells selected are production items of a type which have undergone extensive laboratory testing to determine electron and proton effects. Therefore, output variations among solar-cell groups can be related to solar-cell or solar-cell cover-glass damage. A thermistor imbedded in the solar-cell panel just under the cells will monitor variations in experiment temperature.

To assure experiment accuracy, the cell groups will be calibrated for illumination, angle of incidence, and temperature effect, both after environmental testing and before flight.

THE DELTA LAUNCH ROCKET

The AIMP will be launched by NASA's Improved Delta rocket.

The launch vehicle, including a thrust-augmented Thor first stage, the enlarged Delta second stage, and the FW-4 third stage, is known as the Thrust-Augmented Improved Delta (TAID).

Delta project management is directed by the Goddard Space Flight Center, Greenbelt, Md. The Douglas Aircraft Co., Santa Monica, Calif., is the prime contractor.

Delta Statistics

The three-stage Delta for the AIMP mission has the following characteristics:

Height: 92 feet (includes shroud)

Maximum Diameter: 8 feet (without attached solids)

Liftoff Weight: about 75 tons

Liftoff Thrust: 333,820 pounds (including strap-on solids)

First Stage (liquid only): Modified Air Force Thor, produced by Douglas Aircraft Co., engines produced by Rocketdyne Division of North American Aviation.

Diameter: 8 feet

Height: 51 feet

Propellants: RP-1 kerosene is used as the fuel and liquid oxygen (LOX) is utilized as the oxidizer.

Thrust: 172,000 pounds

Weight: Approximately 53 tons

Strap-on Solids: Three solid propellant Sergeant rockets produced by the Thiokol Chemical Corp.

Diameter: 31 inches

Height: 19.8 feet

Weight: 27,510 pounds (9,170 each)

Thrust: 161,820 pounds (53,940 each)

Second Stage: Produced by the Douglas Aircraft Co., utilizing the Aerojet-General Corp. AS110-118 propulsion system; major contractors for the auto-pilot include Minneapolis-Honeywell, Inc., Texas Instruments, Inc., and Electrosolids Corp.

Propellants: Liquid -- Unsymmetrical Dimethyl Hydrazine (UDMH) for the fuel and Inhibited Red Fuming Nitric Acid for the oxidizer.

Diameter: 4.7 feet (compared to 2.7 feet for the earlier Deltas)

Height: 16 feet

Weight: 6½ tons (compared to 2½ tons for the earlier Deltas)

Thrust: about 7,800 pounds

Guidance: Western Electric Co.

Third Stage: United Technology Corp., FW-4

Thrust: 5,450 pounds

Fuel: solid propellant

Weight: about 660 pounds

Length: about 62 inches

Diameter: 19.6 inches

AIMP PROJECT OFFICIALS, EXPERIMENTERS, AND MAJOR CONTRACTORS

NASA Headquarters

Dr. Homer E. Newell, Associate Administrator for Space Science and Applications.

Jesse E. Mitchell, Director, Physics and Astronomy Programs.

Frank W. Gaetano, Program Manager.

Dr. A. Schardt, Program Scientist.

Theodrick B. Norris, Delta Program Manager.

-more-

Goddard Space Flight Center

Paul G. Marcotte, Project Manager.

Jeremiah J. Madden, Assistant Project Manager.

Dr. Norman F. Ness, Project Scientist.

John J. Brahm, Project Coordinator.

Merrick E. Shawe, Tracking and Data Scientist.

William B. Schindler, Delta Project Manager.

Kennedy Space Center

Robert H. Gray, Assistant Director, Unmanned Launch Operations, Kennedy Space Center.

Experimenters

Dr. K. A. Anderson, University of California (Berkeley)
Energetic Particle Flux.

Dr. James A. Van Allen, University of Iowa
Electrons and Protons.

Dr. H. S. Bridge, Massachusetts Institute of Technology
Plasma Probe.

Dr. Charles P. Sonett, NASA Ames Research Center
Magnetometer.

Dr. Norman F. Ness, NASA Goddard Space Flight Center
Magnetometer.

Gideon P. Serbu and Dr. Eugene J. Maier, NASA Goddard Space Flight Center
Thermal Ion and Electron.

Dr. A. M. Peterson, Stanford University
Lunar Ionosphere and Radiowave Propagation
(Passive experiment using spacecraft telemetry signal)

Dr. W. M. Kaula, University of California (Los Angeles)
Selenodetic Studies (Passive experiment based on analysis of range and range-rate tracking data)

Luther W. Slifer, Jr., NASA Goddard Space Flight Center
Solar Cell Damage.

<u>Major Contractors</u>

Aerospace Division, Westinghouse Electric Corp., Baltimore, Md.
Space Integration.

Douglas Aircraft Co., Santa Monica, Calif.
Delta Rocket.

Thiokol Chemical Corp., Elkton, Md.
Thiokol TE.M.458 Retro Motor.

-more-

AIMP FACT SHEET

Launch: Four-day launch window (three minutes each day) beginning June 30, 1966, at Launch Complex 17, Cape Kennedy, Fla.

Launch Rocket: Thrust Augmented Improved Delta (TAID), with Thiokol retromotor mounted in base of spacecraft to achieve lunar orbit.

Nominal Lunar Orbit: Apolune: 4,000 statute miles
Perilune: 800 statute miles
Period: 10 hours
Inclination: 175 degrees retrograde

Alternate Orbit:

Apogee: 270,000 statute miles
Perigee: 24,000 statute miles
Period: More than two weeks

Design Lifetime: Six months

Spacecraft Weight: 206 pounds including retromotor, with about 20 pounds of experiments.

Main Structure: Octagon shape, 28 inches by 28 inches, 34 inches high (from top of third stage adapter to top of retromotor).

Appendages: Four rectangular-shaped solar panels.
Four transmitting antennas, 16 inches long.
Two hinged magnetometer booms about six feet long.

Power System: Power Supply: Solar cells mounted on four panels to supply minimum average power ranging from 49 to 66 watts with one silver cadmium battery capable of supplying 45 watts of power for three and one-half hours.
Voltage: 19.6 volts
Power Requirements: 45 watts average

Communications and Data-Handling System:

Telemetry: Pulsed-frequency modulation pulse-modulated (PFM-PM).
Transmitter: Seven watt output at a frequency of 136.020 mc.

Encoder: PFM with digital data processor (DDP) for accumulation and storage of data.

-more-

<u>Tracking and Data-Acquisition Stations</u>: Space Tracking and Data Acquisition Network (STADAN) operated by Goddard Space Flight Center with primary stations located at:

<u>Tracking</u>: Carnarvon, Australia
Santiago, Chile
Tananarive, Malagasy
Rosman, North Carolina

<u>Telemetry</u>: Kano, Nigeria
Tananarive, Malagasy
Johannesburg, Republic of South Africa
Santiago, Chile
Orroral, Australia
Rosman, North Carolina
Fairbanks, Alaska

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